EDUCATION TRANSFORMATION FOR NET GENERATION

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Abstract

When life (society) changes rapidly and drastically, school (education) must change accordingly. However, not all changes are good and beneficial for society, so schools must also think critically and work with a time lag that allows for critical reflection and the search for more rational and optimal solutions.
Teachers remain essential in the educational process, but their role changes drastically. This shift should not stem from random decisions by inventive individuals but rather from carefully considered reflections on new pedagogical paradigms. Today, this is called digital pedagogy, which inevitably transitions into generative pedagogy. Moreover, the shift from one to the other is discreet yet represents a quantum leap in an extremely short time. However, the teacher/human is no longer primarily a holder and transmitter of knowledge. Instead, their role increasingly shifts toward education in the affective domain, where they become facilitators of relationship-building and human values.
Keywords: *digital pedagogy, generative pedagogy, net generation, education transformation*

Introduction

Sartre warns that existential questions cannot be answered once and for all. Philosophical questions, by definition, are questions that generations must constantly ask themselves, as this fosters a vivid sense of being alive in us (Sartre, 1984).

The school is more than ever at a crossroads and needs drastic rethinking. A system of constant change is no longer sufficient, but we need a comprehensive renewal, especially in the pedagogical and didactic fields. We must proceed from the fundamental theses of the school as an educational institution, which must develop students as a comprehensive personality. Therefore, it must consider all three fundamental starting points of Bloom's original taxonomy (Bloom, 1956) and all taxonomies developing from it, e.g., the revised Bloom taxonomy (Krathwohl & Anderson, 2001). However, the two fundamental theses still have to remain

1. that the school, is a school for life, and
2. that life (society) is changing faster and more drastically.

From these two premises, if life (society) changes rapidly and drastically, school (education) must change accordingly. Of course, we must be aware that not all changes are good and beneficial for society. So, the school must also think critically and work with a time lag that allows for critical reflection and the search for perhaps more rational and optimal solutions.

https://doi.org/10.33225/BalticSTE/2025.11
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By following these assumptions, we can develop a learner-centred strategy for education from the turn of the 20th century to the 21st century. Based on the generations that meet in today's educational process in formal or various non-formal forms of education, we focus on the transition from Millennials (1981 – 1995) and further Generation Z (Gen Z – 1995 – 2012), colloquially known as Zoomers, which represent the demographic cohort succeeding Millennials and preceding to the Generation Alpha, born between 2010 and 2024. The reason named them Generation Alpha is because they are not a return to the old, but the start of something new. Even more than their parents' generation (the Millennials), there is a greater sense of Generation Alpha being shaped in the new millennium. The fusion of these generations is briefly called the Net (Web) generation.

In short, the school, which should be synonymous with society and education at the turn of the 20th century to the 21st century, is undergoing drastic changes, at least for two key reasons, namely:

1. because technological possibilities allow us to take completely different approaches, strategies, and opportunities for learning and teaching, and
2. because the learners are entirely different from those who were educated during the development of the fundamental pedagogical doctrine, e.g., in the case of digital pedagogy from the end of the twentieth and the beginning of the 21st century.

From the second premise that learners are different and acquire knowledge and skills in different ways, it is necessary to derive additional theses. Analyzing the Web generation reveals several key shifts (Aberšek, 2024). The world is no longer singular; instead, there are two distinct worlds. Intelligence is no longer limited to biological forms (bio-intelligence) but now includes at least two diametrically opposed types—artificial intelligence (e-intelligence)—alongside various transient hybrid forms enabled by neuroscientists, which are creating new kinds of beings or entities, such as artificial life forms (Aberšek, 2023; Aberšek, 2020). Potential learning environments have also evolved dramatically, transitioning from Internet 1.0 (1989) to Internet 4.0 (2020–2022) (Pratschke, 2024). The educational process itself has transformed, shifting from conventional face-to-face education within school settings to complex blended models, with a parallel move from formal education to diverse non-formal approaches (Blended Education). The Net generation exhibits distinct goals, requires different motivational incentives, and learns, acquires, and processes information in fundamentally different ways, necessitating a shift from digital to generative pedagogy. Consequently, teachers face new challenges. In generative pedagogy, the teacher no longer interacts with technology merely as a tool (as in digital pedagogy) but rather as a "colleague" in the form of generative artificial intelligence (GAI).

Technological Change and Education

If we focus on the interactions between technology, society, and education, we must start from the fundamental starting point that the world is no longer one; there are two worlds, the physical and cyber worlds, which intertwine and complement each

https://doi.org/10.33225/BalticSTE/2025.08

other (Aberšek, 2024a). At the same time, we must also emphasize that man is no longer the only intelligent being; artificial intelligence (AI) and physical forms based on it are increasingly appearing - cybernetic physical systems (robots), which increasingly take over from humans a part of his psychomotor activities (robots and other cyber-physical systems) and also cognitive activities (intelligent agents). Physical e-being exists in both the physical and non-physical cybernetic worlds. In contrast, a human can only exist in the physical world, and non-corporeal forms of e-beings exist only in the cyber world but are connected to the physical world with the help of IoT (Aberšek, 2024b; Aberšek, 2024c).

Society and Education

We are all-time travellers, experiencing constant change and gaining new experiences. As we do this, countless connections between nerve cells in our brains are recalibrated to accommodate these experiences. It is as if we are reassembling ourselves every day; we are maintaining a mental construct of ourselves in physical time. The glue that holds together our core identity is memory. Our travels are not limited to physical time. We also experience mental time travel because we visit the past through our memories and then travel to the future by imagining what tomorrow and the following year could bring. When we do this, we think of ourselves as we are now, remember who we once were, and imagine what we will be like. On this basis, let us analyze the research baseline (Kordigel Aberšek & Aberšek, 2020).

Waves of Technological-Social Change

In his book, The Coming Wave (Suleyman & Bhaskar, 2023), Mustafa Suleyman points out that the world is not ready for a wave of powerful new AI technologies. He identified the "problem of containment" and the negation of reality as challenging for our time. Suleyman was far from the first to use this thesis to describe the upheaval that follows the introduction of disruptive new technologies and their impact on society. Joseph Schumpeter used the term "creative destruction" for the latter to describe the dynamics of technological disruption that have driven the so-called waves of innovation in the modern era (McKraw, 2007). Each wave in the series is characterized by a set of technologies that were the leading technology of the era. The first wave (1785 to 1845) triggered the Industrial Revolution with the steam engine, the second wave (1845 to 1900) started the Second Industrial Revolution with electricity, and the third wave (1900–1950) continued the Third Industrial Revolution with the advent of the computer. As each wave of technological change came, the dynamics of creative destruction brought with it new ways of working, living, and education as an integral part of society, but it also destroyed some of what came before. Generation after generation of students, teachers, intellectuals, experts, writers, researchers, and creators were the driving force behind the creative knowledge economy of the time.

Furthermore, the fourth wave (1950–1990), which continued the Third Industrial Revolution, was the era of computing and electronics. It also marks the beginning of artificial intelligence as a field of research when the mission began to create intelligent machines, "thinking machines." Its goal was to create machines that could learn and use human language. Thus, the fifth wave (1990–2020) was the digital age, defined by the

https://doi.org/10.33225/BalticSTE/2025.11

networks made possible by the invention of the Internet (1983) and the World Wide Web (1989) (Berners-Lee et al., 2001).

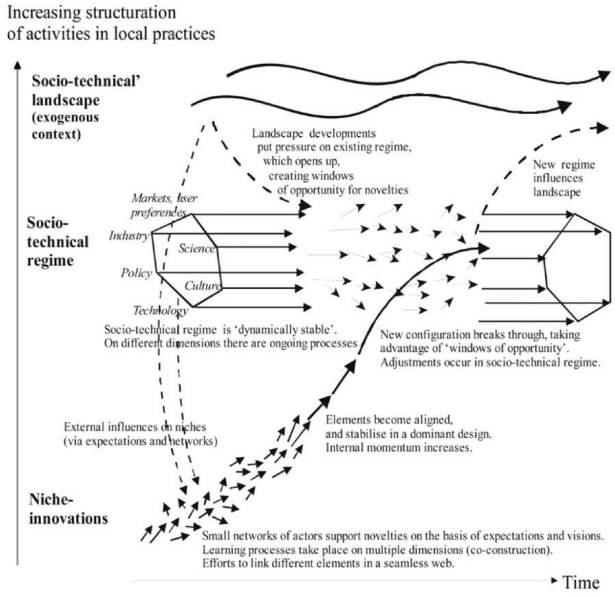
When the fifth wave began to decline, it was logical to continue into the sixth wave. In late 2015, OpenAI was founded by a group that worked to create a secure General Artificial Intelligence (AGI) for the benefit of humanity (Grace et al., 2024). In 2017, a team of Google researchers introduced a new type of transformer architecture (Vaswani et al., 2017) that enabled large language models (LLMs) to flourish in generative AI. (Radford & Narasimhan, 2018). By the end of 2023, the sixth wave had reached shore, and its creative and destructive effects were becoming increasingly apparent.

Generativity and Education

The gap in technological development between the AI industry and the school was more akin to a chasm, as the so-called AI gurus who had created their status overnight loudly proclaimed that the long-awaited "transformation" of education was imminent. In contrast, critical voices within the educational and academic world (pedagogical gurus) responded by refusing to consider its benefits and focusing solely on the harm. After 2022, when the company began to become aware of AI and LLMs, it was common to hear criticism responding to the relentless momentum of the AI industry. Meanwhile, in pedagogical academia, the wave of innovation was more akin to the curve of the Kübler-Ross cycle of grief (Kübler-Ross, 1969). This process began with shock and denial of the capabilities of AI, progressed to anger, followed by depression when these LLMs proved problematic, and finally, acceptance that generative AI (GAI) could remain, as schematically illustrated by Figure 1 (Flogie, Aberšek, 2019).

Figure 1

A Dynamic Multi-Level Systemic View on Socio-Technological Leaps Transition


Increasing structuration
of activities in local practices
Socio-technical' landscape (exogenous context)
Landscape developments put pressure on existing regime, which opens up, creating windows of opportunity for novelties
New regime influences landscape
Markets, user preferences
Socio-technical regime
Industry
Science
Policy
Culture
Technology
Socio-technical regime is 'dynamically stable'. On different dimensions there are ongoing processes.
New configuration breaks through, taking advantage of 'windows of opportunity'. Adjustments occur in socio-technical regime.
External influences on niches (via expectations and networks)
Elements become aligned, and stabilise in a dominant design. Internal momentum increases.
Niche-innovations
Small networks of actors support novelties on the basis of expectations and visions. Learning processes take place on multiple dimensions (co-construction). Efforts to link different elements in a seamless web.
Time

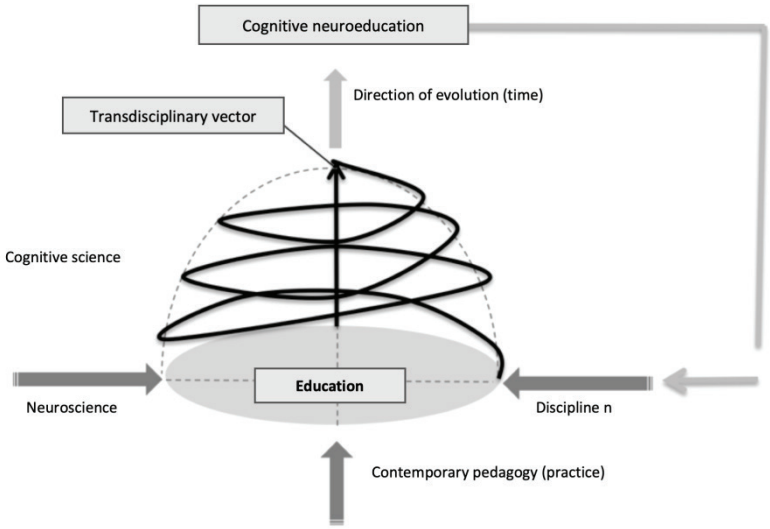
Source. Flogie & Abersek, 2019

Summing-up: What Does All This Mean for Education?

Web 4.0-based GAI is already significantly impacting our economies and political systems and will have an even greater impact on our cultures and ways of working. The exact form of these changes remains to be seen in the future. However, today's development will be extremely rapid and incomparable to any development in the past. The stakes will be exceptionally high for education, where the product is knowledge, and its engine is human intelligence. Artificial intelligence raises important questions about what knowledge is and, thus, about the value of the original transmitter/transmitter of knowledge, the teacher. Indeed, a new pedagogy will (must) be born, let us call it generative pedagogy, which will consider all these dynamic trends in the education field, symbolically illustrated by Figure 2 (Flogie, Aberšek, 2019).

Figure 2

Birth of a New Discipline: Cognitive Neuroeducation Based on Generative Pedagogy



Of course, we need to ask ourselves a few fundamental questions:

- What will be the role of the teacher in a world where GAI knows everything that we humans as a species have ever created, written, or shared?
- What is the value of producing educational content in a world where GAI can instantly recall anything taught or written?
- What is the value of assessment in a world where GAIs autonomously determine and perform their duties?

We do not yet have answers to these and many other questions that we do not even know (Pratschke, 2024). However, the shift in the value of creating, producing, and disseminating knowledge means that the role of the teacher will have to change

https://doi.org/10.33225/BalticSTE/2025.11

drastically, and at the same time, GAI will no longer be treated just as a tool but as a partner. Regardless of the exact form or extent of the changes that are coming, we must prepare for a world in which people and GAIs operate in symbiosis, where the educator is no longer the only voice of authority but, for better or worse, one of many. The transition from today's, let us call it, digital pedagogy to the future generative pedagogy will be discrete, and it will be necessary to make a leapfrog transition, a quantum leap in an extremely short time (see Figure 1). Certainly, however, the teacher/person will no longer be the carrier of all knowledge; his role will increasingly move to the field of education, according to Bloom (1956), to the affective area, where he will become the carrier of the development of relationships and values.

Declaration of Interest

The authors declare no competing interest.

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Received: *April 18, 2025* Accepted: *May 27, 2025*

Cite as: Aberšek, B., & Kordigel Aberšek, M. (2025). Education transformation for net generation. In. V. Lamanauskas (Ed.), *Science and technology education: Expectations and Experiences. Proceedings of the 6th International Baltic Symposium on Science and Technology Education (BalticSTE2025)* (pp. 11–17). Scientia Socialis Press. https://doi.org/10.33225/BalticSTE/2025.11